

Paleoecological implications of dental microwear analysis for the middle Miocene primate fauna from Maboko Island, Kenya. A.K. PALMER, B.R. BENEFIT, M.L. McCROSSIN and S.N. GITAU. Department of Anthropology, Southern Illinois University, Carbondale, IL 62901

Middle Miocene deposits at Maboko Island, Kenya preserve the remains of at least seven primate species which appear to have lived sympatrically. Functional assessments of their postcranial and craniodental morphology indicate that two (the cercopithecoid *Victoriapithecus* and hominoid *Kenyapithecus*) were semi-terrestrial hard fruit and seed-eaters, one (the lorissoid *Komba winamensis*) was a frugivore that may have included insects in its diet, that three (the "small-bodied ape" *Simiolus leakeyorum* and oreopithecids *Mabokopithecus* and *Nyanzapithecus*) were arboreal folivores that may have included fruits in their diet, and that one (*Komba* sp. nov.) was insectivorous. In this study, dental microwear analysis (DMA) is used to test the accuracy of these dietary reconstructions, and to make finer distinctions between animals with broadly similar diets.

Following standard DMA preparation procedures (Teaford, 1994), SEM micrographs were taken of enamel microwear features on phase II (grinding) facets of the lower M2s of all Maboko primates. Features within a 0.2 mm² area were counted and measured for length and width using *Microwear 3.0B* (Ungar, 1997). Consistent with morphological inferences, *Kenyapithecus* and *Victoriapithecus* clearly fall out with modern hard object feeders in percentage of pits and pit width. However, *Kenyapithecus* has much wider pits (18.2 microns) than *Victoriapithecus* (13.3 microns), as well as a higher percentage of pits (61% versus 46%), and may have had a more specialized diet. Clearly folivorous microwear with a high frequency of parallel scratches was found for *Simiolus* (88% of features) and *Nyanzapithecus* (86%). However, *Simiolus* has a greater number of features (251 versus 114) and much longer scratches than *Nyanzapithecus* (78.8 versus 29.9 microns). *Mabokopithecus* has short scratches (37.0 microns), but they represent only 66% of its average 127 features, placing it among modern mixed feeders. Both species of *Komba* have a high frequency of pits (57% and 46%), but *K. winamensis* has wider pits (11.0 microns) and may be more frugivorous. Implications for the structure of the primate community are discussed.

Homeopathic pedagogy or, read some taxonomy and call me in the morning. M. A. PARK, Anthropology, Central Connecticut State University, New Britain, 06050.

Homeopathy is based on the notion that a disease can be treated by administering small doses of a substance that would normally cause symptoms of that disease. As a (very) loose analogy, the difficulty many of our students have in accepting the very *concept* of biological evolution might be seen as the problem, with one "treatment" being to get students so involved in a specific question *within* evolutionary biology that they find acceptance of the general idea to be suddenly quite obvious.

One example I have found to be particularly effective when there appears to be a problem with the overall concept of evolution is the topic of taxonomic nomenclature and categories. Modern taxonomy presupposes evolutionary relationships and constitutes a formalization of some of the most powerful evidence in support of the fact of evolution. Debates within that topic seem inherently interesting to many students. Such questions as whether birds are taxonomically dinosaurs, or dogs are wolves, or chimpanzees are hominids—all these debates can quickly be taken up by my classes, can lead to fairly involved discussions, and can generate numerous and often insightful questions. When such a discussion is over, I can point out that not only do they now have some idea about issues within modern systematics, but also that at no point in our discussion was the general concept of evolution and phylogenetic relationships ever questioned—that no matter which point of view they felt best supported, they took the *fact* of evolution as a given. This tack can work far better than one of preaching what *we* see as the irrefutable logic of the data.

The recovery of skeletal remains of U.S. war casualties and the effect of cultural practices. R.F. PASTOR, United States Army Central Identification Laboratory, Hawaii (CILHI), Hickam Air Force Base, HI 96853.

Search and recovery missions are conducted regularly by the U.S. military in Southeast Asia and other worldwide locations to recover human skeletal remains from aircraft crash sites and isolated burial sites associated with the Vietnam War and other conflicts. These missions consist of a series of small military search and recovery teams, each supervised and provided scientific guidance by a civilian forensic anthropologist. This paper will provide an overview of CILHI field recovery operations, outlining the variability in aircraft crash and burial sites, as well as recovery procedures and techniques.

Standard archaeological survey and excavation techniques are used in the recovery of human remains, life support equipment, and other significant aircraft wreckage in an effort to resolve cases of missing members of the armed forces. Novel field techniques are frequently employed for flooded sites and those with saturated clay soils. Local inhabitants who profess to have witnessed or to have knowledge of a specific incident are frequently interviewed for information such as site location, cultural and other disturbance to the site, and the presence and dispersal of remains or wreckage.

Recovery success is influenced by environmental factors and elapsed time since the incident, and also cultural factors such as local burial practices, scavenging operations, and magico-religious beliefs. The effect of local cultural practices, biological, environmental and other factors on the preservation and dispersal of skeletal remains will be discussed. For example, traditional burial customs of many Vietnamese cultures involves the "rule of 3's" whereby the initial interment of the corpse is subsequently reinterred in a secondary burial, following a three year period of mourning. Such cultural practices

lead to, among other things, an intimate knowledge of bone among local cultures and to possible disturbance of unassociated burials. Spirit and ancestor worship, animism, and other aspects of an Asian belief system also occasionally have a direct affect on the preservation of human remains in burials or crash sites associated with U.S. war casualties.

Growth of Adolescent Chakesang Naga Girls of North-East India. R.K. PATHAK, North-Eastern Hill University, Shillong-793014, India, & P.S. GILL, Univ Of Cincinnati Med Ctr, Cincinnati, OH 45267.

Many studies show that children of most ethnic groups in the world can grow to the international standards. Recent data from India shows that diet and disease, rather than ethnicity, are responsible for short stature of many children (Tonkins, 1994). Northeast India is the homeland of a large number of tribal populations living under diverse environmental conditions. They have varied ethnic backgrounds and cultural traditions. Most of these populations have not been studied for their growth pattern.

The present study reports physical growth of adolescent Chakesang girls of the state of Nagaland, Northeast India. The subjects of this study belong to the indigenous Chakesang tribe inhabiting Phek District. A total of 294 girls aged 10-16 years, have been measured for eight anthropometric measurements following standard techniques. The results of the study describe the pattern of growth based on the above measurements and derived indices including Body Mass Index (BMI).

Comparisons reveal that mean stature of Chakesang girls lie above 75th percentile of national (ICMR) and above 5th percentile of international standards (NCHS). The mean body weight of girls of this study is located at about 90th percentile of ICMR and 25th percentile of NCHS data. The BMI values of adolescent Chakesang girls range between 14.03 and 26.73 and compare well with 50th percentile of those given by Frisancho (1990).

Anthropometric data of adolescent girls from urban and rural communities in Mali, West Africa. L.R. PAWLOSKI, Indiana University, Bloomington, IN 47405.

In Mali, girls spend much of their daily lives preparing meals, pounding millet, gathering firewood, and taking care of children. These physical stresses, combined with a history of poor nutrition, can result in delayed growth and development. Despite the fact that

adolescent girls face great nutritional demands in Mali, most research has focused only on young children and infants. This study examines anthropometric data of adolescent girls in both urban and rural settings.

Anthropometric data were collected from a total of 1045 adolescent girls aged 10 to 17 years. Data were collected from the Segou Coura community in the city of Segou (n = 490) and from 4 villages in the Segou Region (n = 555).

When compared with the NCHS reference population, the majority of both urban and rural girls fell at or below the 35th percentile for mean height-for-age. Furthermore, mean weight-for-age was below the 25th percentile for the majority of both groups in all age brackets.

There were no statistically significant differences in stature between the urban and rural girls. However girls living in the urban community were significantly heavier than those living in the rural areas (ANOVA p = .02).

Previous research in the Segou Region has shown significant differences for stature and weight between rural and urban communities for girls 0 to 5 years. This has been primarily attributed to socioeconomic factors. Among adolescent girls, however, there is a statistically significant difference in weight, but not for height, when this comparison is made. Independently, both studies show low height-for-age and weight-for-age. Therefore, it is important to examine this age group in detail. Further, ethnographic information suggests that energy expenditure, wealth, and cultural eating habits are additional factors which may affect these growth patterns.

Postcranial evidence for the origin of modern humans. O.M. PEARSON, Department of Anthropology, Rutgers University, New Brunswick, NJ 08903-0270.

This study uses postcranial data to test hypotheses about modern human origins. Previous research on modern human origins has focused primarily on cranial and genetic data, but should also include the postcranial skeleton.

Nine recent (Holocene) populations were chosen to sample anatomically modern humans from different geographical regions, climates, and lifestyles. Middle and Upper Paleolithic European, Near Eastern, and African fossils were compared to the recent groups with CVAs using numerous postcranial measurements. Fossils that did not differ significantly from one or more recent groups are considered "anatomically modern".

In common with multivariate studies of crania, the results show that "anatomically modern" hominids become frequent only after the Last Glacial Maximum. Earlier humans tend to be significantly different from all recent populations. This applies to Neandertals as well as most of the Skhul-Qafzeh and Early Upper Paleolithic (EUP) hominids. However, a few EUP and Skhul-Qafzeh specimens qualify as "anatomically modern".

In agreement with genetic data, there is no especially close relationship between Neandertals and recent or EUP Europeans. In many respects, Neandertals and EUP Europeans lie on opposite ends of the recent spectrum of variation. Phenetically, Neandertals are more similar to recent than to EUP Europeans. Either population replacement occurred in Europe during the Middle/Upper Paleolithic transition (or perhaps subsequently) or skeletal morphology is of little

use in tracing population relationships over more than 10,000 to 20,000 years.

The recent groups cluster together closely relative to the distances between any of them and early Upper Pleistocene hominids. Enormous distances separate Neandertals from Skhul-Qafzeh and EUP specimens. Smaller (but still large) distances separate Skhul-Qafzeh and EUP humans. If the Skhul-Qafzeh hominids were ancestral to modern humans, substantial morphological change occurred within the modern human lineage.

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Mortuary and skeletal analysis of the remains of Bir el Djebbana. E. PENNEFATHER-O'BRIEN, Anthropology, Indiana University, Bloomington, IN 47405 and E. MACDONALD, Classics and Religion Studies, University of Ottawa, Ottawa, ON.

The site of Bir el Djebbana lies within the suburban area of Roman Carthage, Tunisia. Three excavation seasons have recovered the remains of a large public bath and over 60 burials. The burials occurred after disuse of the bath and date from the late Roman through Byzantine periods. Grave markers, burial deposition, and orientation suggest that these are all Christian. Many of the burials lie to the east of the bath structure between two well constructed parallel walls which may be a cemetery enclosure. Other burials, which appear to be the earliest, have been recovered from the bath structure itself and utilize materials from its collapse.

Preliminary mortuary analysis has been completed. All but one of the burials is primary and all are relatively undisturbed. However, there are numerous elements of human bone in non-burial contexts suggesting post-depositional disturbance. Age and sex distributions for the sample reveal individuals of all ages, with only a paucity of the very old. Few grave goods have been recovered and are limited to bronze objects such as coins and jewelry, or worked bone. Paleopathologies are few but include degenerative joint disease, trauma, periostitis, and nutritional disruptions.

Mortuary and skeletal analysis of this cemetery will further our understanding of burial practices in the early Christian period, of changes in use the suburban space, and will supply information about suburban Carthaginians in the late third to fifth centuries A.D.

A preliminary examination of the taxonomy of *Leontopithecus* using mitochondrial ND4 and D-loop sequences. B. Perez-Sweeney, M. Forstner, C. Valladares-Padua, D. Melnick.

The genus *Leontopithecus* (lion tamarins) is comprised of four lion tamarins: black-headed lion tamarins (*L. caissara*), black lion tamarins (*L. chrysopygus*), golden lion

tamarins (*L. rosalia*) and golden-headed lion tamarins (*L. cyrsomelas*). Rosenberger and Coimbra-Filho (1984), Della Serra (1951), Natori (1989), and Mittermeier et al. (1988) consider the golden (GLT), golden-headed (GHLT) and black lion tamarins (BLT) to be differentiated enough, particularly in their cranio-dental morphology, to warrant separate species status. However, genetic research on allozymes by Forman et al. (1986) support consideration of these taxa as a single species.

The black-headed lion tamarin's (BHLT) identity as a unique species (Lorini and Persson 1990) rather than a subspecies of the BLT has been questioned by Coimbra-Filho (1990) based on finding lion tamarins that are intermediate in coat color between BHLTs and BLTs.

We sequenced the ND4 region and D-loop region of the mitochondria to determine the taxonomic relationships of the lion tamarins. No variable informative characters exist in the ND4 region. From maximum parsimony and neighbor-joining analysis of D-loop sequences, strong support for a monophyletic clade containing GLTs and GHLTs is evident. The BLT clades are paraphyletic to the BHLT clade and GLT/GHLT clade in these same analysis. In a neighbor-joining tree rooted with *Callithrix*/*Callimico*, the GLT/GHLT lion tamarin clade is separate from the other lion tamarins. These results support Coimbra-Filho's (1990) suggestion that golden and golden-headed lion tamarins should be grouped separately from black and black-headed lion tamarins. The lack of variability in the ND4 region leads us to believe that these taxa have not been separated for very long and may not be separate species. However, enough distinction does exist in the D-loop to recognize at least two evolutionarily significant units- the black-headed/black lion tamarins and the golden-headed/golden lion tamarins. An increase in the number of individuals sampled per population of lion tamarins would help identify genetic management units.

Stature and stress in a 19th-century middle class skeletal series. S. M. PHILLIPS, University at Albany, State University of New York, Albany, NY, 12222.

The purpose of this work is to test the hypothesis that health differences between classes in North America increased during the 19th-century. To date, most 19th-century skeletal series are associated with individuals from society's lowest economic strata. This study examines a middle class skeletal series from upstate New York. Data on stature, porotic hyperostosis, and linear enamel hypoplasia (LEH) are presented to determine early life health experiences. The stature estimates (male mean = 176; female mean = 160) show this series is taller than most other published contemporary stature data. The frequency of porotic hyperostosis (> 35%) and LEH (> 70%) demonstrate the middle class still experienced poor conditions, although their overall growth potential did not suffer.

The data sources for this study include the Oneida County Asylum (OCA) skeletal series (interments occurred circa 1880-1894; N=100) and socio-cultural information gleaned from historical documents. Standard ageing and sexing methods were utilized in this analysis. Likewise, standard

maximum length measures were taken on available long bones and inserted into the appropriate stature regression formulas. Data on porotic hyperostosis and LEH were collected and coded according to the *Standards Manual* specifications. The documentary evidence includes information on work history prior to asylum incarceration, life expectancy, and nutritional and health data.

The OCA records demonstrate its inmates were drawn from middle class families who could afford to pay for care. Wealthy families sent disturbed family members to private asylums and the destitute mentally ill were sent to large, tax supported state institutions. Thus, the skeletal series associated with the OCA represents a cross-section of middle class upstate New Yorkers. This study shows that by the early to mid 19th-century the stature of middle class individuals had began to exceed that of their poorer neighbors. Data on skeletal stress markers, however, shows that this series differed less from the poorer classes. These data indicate the early to mid 19th-century may be the period in the Northeast that health differences between classes is first visible in the osteological record.

Computer Simulation of the Effects of Partner Exchange Rates on HIV Virulence Evolution.

D.S. PIECZKIEWICZ, National Micropopulation Simulation Resource, University of Minnesota, Minneapolis, MN 55455 and University of Kansas; J.H. MIELKE, University of Kansas, Lawrence, KS 66045.

Recent theoretical work has challenged the traditional assumption that pathogens inevitably become less virulent over time. The new models postulate that a pathogen's mode(s) of transmission generate varying selective pressures resulting in decreasing, static, or even increasing virulence over time. In particular, the virulence of sexually transmitted pathogens (e.g., HIV) has been hypothesized to be directly proportional to host sexual partner exchange rates.

To explore the feasibility of such theories, several stochastic, discrete-time, micropopulation simulations of HIV spread in behaviorally heterogeneous populations were implemented. Synthetic cohorts were constructed whose members acquired different- or same-sex partners probabilistically. At the outset, a small portion of each cohort was infected randomly with five strains of HIV of varying virulences, measured by the time from infection to the onset of symptomatic AIDS. Multiple scenarios were created with different average partner exchange rates, as well as changes in these baseline rates during the simulation runs. Each scenario was run 100 times to obtain average measures and confidence intervals for overall virulence in the populations.

The results indicated that populations with higher partner exchange rates exhibited higher overall virulences over time. Further, populations which increased or decreased their exchange rates during the simulations experienced parallel increases and declines in overall virulence, respectively. Changes in virulence were more apparent if changes in partner exchange rates were made before equilibrium was established.

While the practical, public health implications of such findings, if reflective of reality, are yet to be determined conclusively, the results lend support to the idea of rethinking virulence evolution in natural populations. Finally, we comment on the advantages of such schemes of micropopulation simulation, in which

individual agents are modeled explicitly, for research in anthropology, biomedicine, and the general sciences.

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Cut sternums in Tlatelolco, Mexico City: evidence of human sacrifice by heart extraction? C. PIJOAN, Antropologia Física, Instituto Nacional de Antropología e Historia, Mexico 11560 DF.

Cultural taphonomic alterations in the human skeletal remains of multiple burial number 14 found during the 1961-64 archeological explorations of the sacred inclosure of the prehispanic city of Tlatelolco (1337-1521) are reported. A large number of the sternums had been cut transversely in two. This multiple burial consists of remains of 153 individuals, many of whom show marks of defleshing and dismembering.

Biobehavioral determinants of postpartum maternal nutritional status for nomadic Turkana women of Kenya. I.L. PIKE. The Ohio State University, Columbus, OH, 43210.

Turkana herders are subsistence pastoralists that maintain generally low levels of nutrition. Turkana women, who experience repeated cycles of pregnancy and lactation coupled with demanding work loads, are at greater risk for poor nutrition. For these populations, any biobehavioral trait that enhances a woman's nutrition during lactation has many potential benefits. These potential benefits include enhanced maternal health and well being, and lactational performance. Previous Turkana studies have found that maternal nutritional status and the nutritional status of breastfeeding infants are correlated. Thus, better postpartum nutrition also has the potential to enhance infant nutrition and health.

A total of 68 pregnant Ngisonyoka Turkana women were monitored prospectively from August 1993 to July 1994. A smaller sample (n=25) was monitored for 4 months postpartum. Maternal anthropometry (weight, summed skinfolds), health, and diet were assessed.

For Turkana women, weight gain during pregnancy is low and skinfold measures decrease, for the majority of the women, throughout gestation. Following the first month postpartum, maternal weight increases slightly for the next two months. Maternal skinfold measures do not increase as steadily as weight and show greater variation between women. In principal components analysis, maternal age (eigen value = 1.945), and season of delivery (eigen value = 1.732), are the two most important factors linked to maternal anthropometry. The importance of seasonality and the age-related pattern for postpartum

nutritional recovery is discussed. There is ethnographic evidence to suggest that the age pattern of nutritional recovery is linked to cultural beliefs and practices. These results are discussed within the larger context of the ecology of reproduction.

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Craniofacial and body mass dimorphism in anthropoid primates. J. M. PLAVCAN, New York College of Osteopathic Medicine, Old Westbury, NY 11568.

Because body mass dimorphism is associated with mating systems in extant species, dimorphism offers potentially important clues about the mating systems of extinct species, including hominids. Statements about body mass dimorphism and mating system in extinct species often are made on the basis of craniofacial dimorphism. Yet there have been few systematic studies of the relation between craniofacial and body mass dimorphism across extant species. This study compares craniofacial dimorphism to mass dimorphism in extant anthropoid primates.

Forty cranial measurements were gathered for 25 anthropoid species. Only wild-shot specimens from restricted geographic localities were used. Dimorphism was estimated as the natural log of the ratio of male mean to female mean values for each measurement. Body mass data were taken from Plavcan and van Schaik (1997), Smith and Jungers (1997), and from field data of the specimens measured. Comparisons were made between cranial and mass data using both least squares and reduced major axis regression.

The strongest correlate of mass dimorphism is basicranial length ($r = 0.915$). Correlations for other dimensions range from 0.842 (bizygomatic breadth) to 0.260 (postorbital breadth). Fifteen dimensions show strong negative allometry compared to mass dimorphism, while sixteen dimensions show strong positive allometry. Several dimensions show substantial taxonomic differences in the relation between craniofacial dimorphism and mass dimorphism.

The results demonstrate that the relation between craniofacial and mass dimorphism differs among dimensions and among taxa. Thus, inferences about body mass dimorphism will vary strongly depending remains available, and the phylogenetic position of the taxon. This will, in turn, affect interpretations of species recognition and inferences of behavior made on the basis of craniofacial remains.

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A comparison of EMG- and optimization-based estimates of force in hip abductor muscles during level walking. J.D. POLK Doctoral Program in Anthropological Sciences, X. CHEN Department of Anatomical Sciences, SUNY at Stony Brook, NY and L.M. MACLATCHY Department of Anthropology, Boston University, MA.

Quantitative data on hip abductor muscle forces are useful for evaluating bone distribution and density patterns in the hip and proximal femur. Evaluating the distribution of force among synergistic muscles during locomotion has proven to be a difficult task, and numerical optimization techniques have frequently been used to address this problem. While these optimization methods have provided useful estimates of muscle forces there have been few attempts to validate these results.

In an attempt to test the validity of these methods, we have estimated hip abductor muscle forces using a different technique. We have combined quantitative intramuscular electromyographic (EMG) data of 6 human subjects walking on a level surface with published data on muscle physiological cross-sectional areas (PCSA) to estimate muscle forces. The muscles included are gluteus medius, g. minimus, tensor fasciae latae, and the lower portion of g. maximus. Peak muscle forces as well as the muscle forces occurring at the time of peak joint force (15% of stride duration) were calculated and compared to the values of several published optimization studies.

The magnitudes of the forces from optimization studies are consistently higher than those of the EMG-based estimates, and the timing of peak force production in the optimization studies does not correspond well to the forces estimated from EMG signals. Since muscles cannot produce force without electrical stimulation, we suggest that the EMG-based force estimates more accurately reflect the timing of force production. The observed differences in force magnitude between the EMG and optimization-based studies may reflect a number of factors. However, this discrepancy may be explained in part by the observation that optimization techniques overestimate joint forces (Brand *et al.*, 1994). Since joint forces are dependent upon muscle forces, it follows that optimization techniques probably also overestimate muscle forces. In comparison, the lower EMG and PCSA-based force estimates may provide a more direct, physiological representation of hip abductor forces during walking.

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Dental diversity of early New World populations: Taking a bite out of the tripartite model. J.F. POWELL, Department of Anthropology, University of New Mexico, Albuquerque, NM 87131 and W.A. NEVES, Instituto de Biociencias, Universidade de Sao Paulo, C.P. 11461, 05422-970 Sao Paulo, SP, Brazil.

Previous analyses of dental variation in the Americas have identified three dental morphological groups thought to

represent three separate waves of migration from northeast Asia (Greenberg et al. 1986). Extensive morphological studies independently carried out in North and South America (Neves and Pucciarelli 1989, 1991, 1995; Steele and Powell 1992, 1994) indicate that the earliest colonizers of the Americas were morphologically distinct from northeast Asians and recent American Indians.

Reassessment of the published literature on dental variation in the Americas also revealed that North American Paleoindian and Archaic populations are morphologically unlike northern Asians or modern Amerindians (Powell 1995).

In this study we collected dental discrete traits from affirmed South American Paleoindians, dating from 8,500 - 11,700 yr B.P. (Lapa Vermelha IV, Cerca Grande 5 and 6, and Santana do Riacho I) and compared them with previously published data from North American Archaic and late Holocene Asian populations. Data were scored using the Arizona State University dental anthropology system (controlling for inter-observer error with Turner) and dichotomized following Turner (1990). Discrete trait frequencies were used to compute unbiased B^2 distances (Balakrishnan and Sanghvi 1968), which were displayed using multidimensional scaling and cluster analyses. The ordination of biological distances showed that South American Paleoindians and North American Archaic samples are dentally distinct from both northern Asian Sinodonts and southern Asian Sundadonts. Cluster analyses also resulted in a separation of ancient Americans from both Sinodonts and Sundadonts. These results support the previous findings of Neves and Pucciarelli and Steele and Powell, and indicate that the biological variation of recent Native Americans cannot be used to fully explain the process of the peopling of the Americas.

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"Syphilis in Mound Builders' Bones": Treponematoses in the prehistoric Southeast. M. L. POWELL, University of Kentucky, Lexington KY, 40506-0024, and L. E. EISENBERG, BSPS - State Historical Society of Wisconsin, Madison WI, 53706.

J. Jones' 1876 identification of 'syphilis' in prehistoric Native American skeletal remains from Tennessee was followed by similar physicians' diagnoses (Moore 1907, Williams 1936, Haltom and Shands 1938, Webb and Snow 1945) in remains from Alabama, Florida, Kentucky, and Ohio. All of these were made in the absence of appropriate alternative models for non-venereal treponemal disease (yaws and endemic syphilis), which did not become generally available in the medical literature until the 1950's.

Our re-examination of paleopathological data from Archaic,

Woodland, and Late Prehistoric Southeastern US contexts suggests that one or more forms of endemic treponematoses, similar to but not identical with the recognized modern syndromes, existed in this region possibly as early as 3000 BP. The skeletal markers are rarely observed before 1000 BP, however, and the highest levels of prevalence appear in large Late Prehistoric series. Cranial lesions are less common than in Midwestern population samples. The mortuary contexts of affected and unaffected individuals show no patterned distinctions. No convincing evidence of venereal syphilis, either acquired or congenital, appears in these precolumbian populations.

The Discovery of Cerebral Diversity: An Inconvenient Scientific Revolution. T.M. PREUSS. Division of Behavioral Biology, University of Southwestern Louisiana - New Iberia Research Ctr., New Iberia, LA 70560 USA

Historically, students of mammalian neuroanatomy and brain evolution have paid little attention to phyletic variation in the cellular and connective organization of cerebral cortex. This is due to the widespread belief that there really *is* no significant variation in the internal organization of cortex, and that taxa vary mainly in the amount of cortex they possess. As a result, understandably, the study of brain evolution has been dominated by studies of relative brain size.

Notwithstanding the popularity of the view that there is a "basic uniformity of structure of the neocortex" (as the well-known paper of Rockel, Hiorns, and Powell [1980] put it), new techniques for examining brain organization developed since the 1970s have revealed a great wealth of phyletic variation in the internal organization of the cortex. Taxa vary in the biochemical and morphological phenotypes of cortical neurons, in the laminar and modular organization of intrinsic and extrinsic cortical connections, in the distribution of neurotransmitters and receptors, and in the patterns of connections between cortical areas. Moreover, taxon-specific cortical areas have evolved in a number of mammalian orders, including primates.

These findings have several inconvenient implications. For one, it is evident that the cortices of different mammals can by no means be adequately viewed as larger or smaller expressions of a common "plan." For another, since variation in cortical organization suggests variation in psychological function, we must take seriously the possibility that the minds of other animals are not simply lesser versions of our own, but may be different in some fundamental ways. Thus there may be important discontinuities in psychological evolution, contrary to Darwin.

At the same time, these new findings point the way toward a new evolutionary biology of cerebral cortex. The discovery of cortical variation coincides with the development of modern cladistic methodology, which can be used to reconstruct the evolutionary history of the brain. Efforts are currently underway to determine the morphotypic organization of mammalian cortex and to identify the apomorphic cortical states of primates, of anthropoids, and of hominoids. The increased use of non-invasive techniques by comparative neuroanatomists (such as

immunocytochemistry and MRI) will expand the range of species available for detailed neuroanatomical investigation and lead to better evolutionary reconstructions.

Electronically aided preparation of fossilized skulls:

Medical imaging techniques and algorithms as an innovative tool in paleoanthropological research. H. PROSSINGER, G. WEBER, H. SEIDLER, W. RECHEIS, R. ZIEGLER, D. ZUR NEDDEN. Institute of Human Biology, University of Vienna; Dept. of Radiology II, Innsbruck University Hospital, Austria.

Since the 1980s, CT-imaging of human fossils has become an indispensable tool in paleoanthropology. It, combined with stereolithographic modelling, makes internal structures visible. On the other hand, a problem, when dealing with fossilized material, is the discrimination of fossilized bone from embedded stony matrix material, which has frequently accumulated over repository times beyond 100 thousand years. The middle-Pleistocene skull of STEINHEIM (dated at 250 000 years) as well as the more recent specimens Petralona (Greece), Broken Hill (Kabwe, Zambia) and Arago 21 (France) have been designated as members of the species *Homo heidelbergensis*. Comparisons of the anterior cranial fossae of Petralona and Broken Hill with Arago 21, based on the analysis of the stereolithographic models suggest that external resemblance may not always correlate with endocranial similarity. A better knowledge of the endocranial morphology of Steinheim would enhance our understanding of middle-Pleistocene hominid evolution, diversity, speciation and specialization. However, the braincase of Steinheim is heavily incrustated with inorganic matter which covers the anterior cranial fossae. Because the bone substance has been, in time, transformed into inorganic matter as well, both the fossilized bone and the incrustations have similar Hounsfield numbers. The use of the software package Analyze and the implementations of various algorithms (filtering and watershed) programmed in Fortran and C can provide the sought for discrimination between fossilized bone and embedding matrix material. Using the uncovered structure in our subsequent morphological analysis, we conclude that the species designation *Homo heidelbergensis* is not applicable to all these skulls. The Steinheim skull exhibits a more progressive endocranial architecture and possesses some further differing features. It is notably different from Petralona and Broken Hill. Due to material limitations, we have attempted to be extremely cautious in interpreting taxonomic implications of these exciting morphological features. Nonetheless, medical imaging techniques have proved to be an important tool in analyzing the morphology of fossilized skulls.

Growth of skeletal components in the squirrel monkey (*Saimiri sciureus boliviensis*). A longitudinal study. H.M. PUCCIARELLI, M.C. MUÑOZ, A.B. ORDEN, AND E.E. OYHENART, CIGIBA, Fac. Cs. Veterinarias, UNLP, cc:296, 1900 La Plata, Argentina.

This study was carried out to test the null hypothesis: "the growth of major

functional skeletal components may be described by a single equation, independently of sex and/or environmental influences". Twenty growing squirrel monkeys were employed. Five males and five females (controls) were fed ad libitum on a 20% protein diet. The remaining animals (undernourished) were fed ad libitum on a 10% protein diet. Between the 12th and the 36th month from birth, they were X-rayed monthly, from lateral and superior views. The length of the femur, and the length (L), width (W), and height (H) of the neurocranium, face and pelvis were measured. A volumetric index (VI) for each component was calculated: $VI = 100(L \times W \times H)^{1/3}$.

The null hypothesis was rejected since three main growth trends were seen: 1) measures non correlated with age (undernourished male and female body weights), 2) measures entirely explained by the simple $y = a + b(x)$ equation (femur length in all groups, and pelvic VI in control and undernourished females), 3) the remaining measures were fit by three different standard four-function equations belonging to the generic: $y = a + bx + c f_1(x) + d f_2(x) + e f_3(x)$. The first equation explained neurocranial and facial growth in control females. The second one described the same components in the remaining groups. The third one fit growth of the pelvic VI in control and undernourished males, and body weight in controls. The four-function model suggests an ascendent sinusoidal growth trend in components showing lower growth rates than those described by the simple regression equation.

The reliability of composite portraits in forensic-anthropology: the death-mask of Napoleon 1st (1769-1821). P.-F. PUECH and H. ALBERTINI, Musée de l'Homme, BP.191, 30012 NIMES cx4, France.

Facial profile analysis, which uses a series of anthropometric measurements to characterize facial features, has been developed. The profile provides critical data on surface anatomy in the diagnosis of cranial traits. In forensic sciences, Alphonse Bertillon invented sets of measurements but false identifications are occasionally made.

To explore the relationship of death-mask to portrait, comparisons are first concerned with deformations. Galton (1879) proposed a system judging identity is better characterized by 'head recognition' rather than by 'features recognition'. He combined several portraits of the same person to produce an accurate depiction of that person by reducing erroneous idiosyncrasis. This highlights an important issue which is relevant to death-masks: the picture must be tolerant to allow the recognition of a face that has undergone physical degradation. The identification must not

solely be conducted at the level of individual features, but faces are to be seen as a whole. This is made through a composite process that abstracts not only the average shape of the features of a person, but also the average configuration of those features.

The shape of facial features of Napoleon was defined by manually marking anthropologic feature points on portraits. The average position of each feature point was calculated and joined to produce a line-drawn representation of the 'average' face-shape drawn by Dutertre, Gros, Ingres and David. Using this 'composite' portrait and the mask made by Burton the 7 May 1821, it was concluded that portrait / death mask superimposition is reliable when four or more portraits are used in comparison.

The Genetic Structure of Hueyapan, Puebla Mexico

S. PUPPALA and M. H. CRAWFORD

Department of Anthropology University of Kansas, Lawrence, KS 66045

A considerable admixture was observed in American Indians of Mexico due to gene flow of European and African migrants. In Mexico, European and African components were introduced through Spaniards between 16th and 19th centuries. The phylogenetic relationships between American Indians of Mexico indicated that a few populations exhibit a relatively higher admixture with Spaniards. The present paper gives an opportunity to study the genetic structure and the phylogenetic position of Hueyapan, an Indian community from Mexico.

A total of sixty one Hueyapan individuals, from the state of Puebla Mexico were examined to characterize the distribution of blood group antigens among Hueyapan in relation to the ABO, Rh, MN, P, Duffy, Diego and Kell systems. The phylogenetic position of Hueyapan was assessed by using R-matrix analysis on seventeen alleles from seven genetic loci representing 16 populations.

The gene frequencies of Hueyapan closely resemble the allelic frequencies of Middle American Indian populations with a high frequency of O, M, CDe, cDE, Duffy, Diego and absence of Kell systems. The absence of 'cDe' (an African) and 'cde' (an European) characteristic feature showed that Hueyapan is probably an Amerindian population relatively unadmixed.

The R-matrix analysis explained 33% of the total variation. The first eigenvector separated Hueyapan from the other tribes of Mexico but clustered with San Pablo because of their similarities in allele frequencies and language. Regression of distance from centroid and mean per locus heterozygosity showed that Hueyapan had higher heterozygosity. Thus this study concludes that Hueyapan may be an Indian population with little or no admixture with Spaniards.

Evolutionary stasis of maxillary sinus size in Hominoidea. T.C. RAE¹ and T. KOPPE², 1. Dept of Anthropology, Univ of Durham, 43 Old Elvet, Durham DH1 3HN, UK, 2. Dept of Anatomy, Okayama Univ School of Dentistry, 2-5-1, Shikata-cho, Okayama 700, Japan

The size of the maxillary sinus has figured in many recent discussions of the evolution of hominoids and of the phylogenetic position of several fossil taxa. Current hypotheses for the pattern of evolution of maxillary sinus size in hominoids range from evolutionary stasis across the superfamily, to one or even two distinct enlargements of the sinus across the clade. The extent to which the observed variation is explained by body size, however, has not been assessed. We report here on a test of the hypothesis that the size of the maxillary sinus has remained unchanged, relative to body size, for these taxa.

Serial CT scans (coronal) were obtained from adult hominoid (gibbons, orang-utans, gorillas, chimpanzees, humans) crania ($n = 58$) and used to reconstruct the crania in three dimensions (including internal structures) on a graphics workstation. Sinus volume was calculated and regressed against several linear skull parameters (as body size surrogates) in log-log space.

Hominoids as a whole show a positive relationship between body size and sinus volume ($r^2 = .67-.83$, depending on size variable). None of the living apes deviate significantly from the regression line; body size accounts for nearly all of the variation in hominoid maxillary sinus size and the null hypothesis of evolutionary stasis cannot be rejected. The suggestions that a very large sinus is an orang-utan autapomorphy and that gibbons have a smaller sinus than great apes are not supported. These results suggest that previous hypotheses of clade membership for fossils based on sinus size must be reevaluated.

Interaction, social change, and biology at the Larson site. C.A. RAEMSCH, Hartgen Archeological Associates, Inc., Troy, NY 12180.

Over the past few decades, interpretations of Arikara occupation of the Larson Site, South Dakota (AD 1679-1733) have been modified based on new analyses of cultural and skeletal data. This research addresses whether further re-interpretation of Larson social organization and interaction with neighboring groups is warranted.

Ethnohistoric documentation and bioanthropological studies of late 17th to early 18th century Arikara social organization have indicated an endogamous, matrilineal occupation at Larson. Craniometric data within the

sample is thus expected to reflect relative genetic homogeneity overall, and less variability among females than among males. This research evaluates the validity of this assumption through an analysis of within-sample craniometric variability utilizing a newer approach toward interpreting and understanding patterns of intra-site skeletal variation.

The magnitude of biological variability within the Larson skeletal sample is judged relative to that found within other samples of known biological composition. The determinant of the variance-covariance matrix for each sample is used as a measure of within-sample variability. Samples are compared in order to identify the extent of differences, if any, in variances between groups of differing social organization, and thus of differing biological composition. A bootstrap procedure is used to determine the significance of any noted differences in variability among the samples.

The results of this study indicate that Larson is more heterogeneous in composition than other endogamous groups, and that Larson females are more variable than that expected based on previous interpretations of the site. These patterns contradict previous assumptions regarding this group's social behavior and necessitate a re-examination of the site, and of assumptions used in studying the social organization of past populations. Events that may have influenced the magnitude of biological variability at Larson are discussed.

The derived mandible of Homo neanderthalensis. Y. RAK, Anatomy and Anthropology, Tel-Aviv University Medical School, Tel-Aviv, Israel.

The old contention that the mandible bears fewer taxonomic characters than the calvaria and the overwhelming influence exerted by the absence of a chin in the Neandertal mandible--which hence has been categorized as primitive--seem to be the major reasons that so many derived anatomic features of the Neandertal mandible have gone unnoticed, been ignored, or been played down as primitive. However, the facts are different. As expected from the highly specialized morphology of the Neandertal face, the mandible, as the face's counterpart in the masticatory system, also bears many autapomorphic features. Among these are the retromolar space, the squarish outline of the front of the mandible, the middle pterygoid tubercle, and the unique relationship between the ridge of the mandibular notch and the condyle. To ascertain the shape of the notch between the condylar and coronoid processes of the mandibular ramus and the morphology of these processes, I developed a method of quantifying

the shape of these structures. Analysis of the contour's slope indicates that Homo sapiens, including the early Skhul and Qafzeh, and Homo neanderthalensis differ significantly in the shape of the mandibular notch.

All the derived characters in the Neandertal mandible, whether we can explain the functional meaning or not, are of great taxonomic and phylogenetic value. Simple considerations of parsimony undermine the traditional view of the Neandertal's role in the evolutionary history of our species.

Variability in the cathemeral activity cycle of two lemurid primates at Ampijoroa, northwest Madagascar.

M. A. RASMUSSEN, Biological Anthropology & Anatomy, Duke University, Durham, NC 27708.

Cathemeral primates display significant levels of activity during both the dark and light portions of the 24-hour cycle (Tattersall, 1987). While such 24-hour activity is common in other mammals, it is relatively rare in primates. Cathemerality has been reported in several lemur species in Madagascar, and may also characterize some species of Aotus, the Neotropical night monkey. Although the cathemeral activity cycle in primates has been recognized and defined in recent years, its patterns and adaptive significance in wild populations have until now remained poorly studied.

In this paper I present results from a 15-month study of two cathemeral primates in northwest Madagascar: Eulemur mongoz (mongoose lemur) and Eulemur fulvus fulvus (common brown lemur) occur sympatrically in the semi-deciduous dry forest of Ampijoroa in the Ankarafantsika Nature Reserve (46°50'E, 19°16'S). Morphometric and behavioral data indicate that the overall differences between the two species in body size, diet, and ranging are subtle. However, there are pronounced interspecific differences in social structure and activity patterns. While both E. mongoz and E. f. fulvus populations at Ampijoroa are cathemeral, activity data show that distinct forms of cathemerality characterize the two species. E. mongoz is almost exclusively night-active during the long dry season (May--October) and completely day-active during the rainy season (December--March). In contrast, E. f. fulvus is day-active throughout the year and engages in nighttime activity only during the dry season. Seasonal differences are also discernible in the 24-hour activity budgets of the two species, particularly with regard to rest bout length and the timing of activity peaks.

I propose that contrary to recent suggestions that cathemerality in lemurs is nonadaptive (van Schaik and Kappeler, 1996), the distinct and seasonal patterns of cathemerality evinced by E. mongoz and E. f. fulvus at Ampijoroa suggest that this activity cycle has an ecological basis and, therefore, an adaptive significance.

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